

SEEDS January 2024 Conference Program

seeds

SCIENCE EDUCATORS FOR EQUITY, DIVERSITY, & SOCIAL JUSTICE

***Disturbing Settled Expectations:
Re-imagining Science Education through Multiplicity***



**In-Person Conference
University of Arizona, Tucson, Arizona, USA
January 19–21, 2024**

Conference Schedule At a Glance

Friday, January 19 (Times are in MST)

12:00 - 3:00 PM	Pre-conference Experience (learn more and register here)
4:00 - 5:00 PM	Conference registration/Check-in
6:30 - 8:00 PM	Welcoming session and Town Hall 1

Saturday, January 20 (Times are in MST)

8:30 - 10:00 AM	Wondering concurrent sessions
10:00 - 10:20 AM	Break/Coffee
10:30 - 11:30 AM	Scholarship Incubator and Workshop concurrent sessions
11:45 - 12:45 PM	Wondering and Workshop concurrent sessions
12:45 - 1:45 PM	Lunch (catered)
2:00 - 3:30 PM	Wondering concurrent sessions
3:30 - 3:45 PM	Break/Coffee
3:45 - 4:45 PM	Scholarship Incubator and Workshop concurrent session
5:00 - 6:00 PM	Workshop concurrent sessions
6:00 - 6:30 PM	Break
6:30 - 8:00 PM	Annual General Meeting + Town Hall 2

Sunday, January 21 (Times are in MST)

8:30 - 9:30 AM	Wondering and Workshop concurrent sessions
9:45 - 10:45 AM	Scholarship Incubator and Workshop concurrent sessions
10:45 - 11:05 AM	Break/Coffee
11:10 - 12:40 PM	Scholarship Incubator and Wondering concurrent sessions
12:45 - 1:45 PM	Lunch (catered)
1:50 - 2:50 PM	Scholarship Incubator and Workshop concurrent sessions
3:00 - 4:00 PM	Town Hall 3 + Closing

Friday, January 19 (Times are in MST)

12:00 - 3:00 PM	Pre-conference Experience (<i>learn more and register here</i>)
4:00 - 5:00 PM	Conference registration and Check-in
6:30 - 8:00 PM	<p>Welcoming Session</p> <p>Town Hall 1: On Intergenerational Resistance and Activism in Oppressive Educational Contexts: Testimonios from the Southwest</p> <p><i>Sara Tolbert, University of Canterbury</i></p> <p><i>Abstract:</i> In this town hall, panelists will share their experiences working within the context of decades-long oppressive educational and political legislation against LGBTQ, migrant, and Indigenous communities, and other communities of color in the Southwest US. This topic is particularly relevant given the recent anti CRT laws that are emerging across the US. Our panel will be grounded in theories of critical pedagogy (Ginwright & Cammarota, 2012; Grande, 2015), language activism (Combs & Penfield, 2012), community organizing, and developing strategies for resistance within rigid sociopolitical constraints (Gutierrez, 2016). Panelists will both share and elicit from attendees how they have engaged with students, local communities, policymakers, and activists in racist-nativist educational settings, in the name of building solidarity.</p>
8:00 - 9:00 PM	Celebrating Practitioners

Saturday, January 20 (Times are in MST)

8:30 - 10:00 AM	Wondering concurrent sessions		
	<p>Wondering Session 1: Considerations for Environmental Justice through Place-Based Science Education</p> <p>1A. How might place-based environmental justice curricula resonate</p>	<p>Wondering Session 2: Questions of Success, Identity, and Discourse for Equity in Science Education</p> <p>2A. The experiences of successful international women in science</p>	<p>Wondering Session 3: Supporting Pre-service Science Teachers' Critical Consciousness</p> <p>3A. Secondary science preservice teachers' onto-epistemologies</p>

	<p>with students and teachers in other places?</p> <p><i>Sarah Stapelton, University of Oregon</i></p> <p>1B. Seaweed farming in Belize: Ecojustice authentic science</p> <p><i>Allan Feldman, University of South Florida</i> <i>Rita Ortiz, University of South Florida</i></p> <p>1C. What could doing better look like? Disrupting and desettling elementary preservice teacher education with community based environmental justice learning experiences</p> <p><i>Lauren Wagner, Florida State University</i> <i>Ronan Rock, University of Illinois Chicago</i></p>	<p><i>Jonathan Hall, California State University, San Bernardino</i></p> <p>2B. The excluded black male STEM educators</p> <p><i>Samuel Katende, University of Houston</i></p> <p>2C. Approaching equity through discourse: A wondering on equity and talk</p> <p><i>Sierra Morandi, Florida State University</i></p>	<p><i>Kate Miller, Michigan State University</i></p> <p>3B. Supporting the development of preservice teachers' critical consciousness</p> <p><i>Megan Walser, Michigan State University</i></p> <p>3C. Desettling elementary science teacher preparation to grapple with race</p> <p><i>Alicia Alonzo, Michigan State University</i></p>
BREAK/COFFEE (10:00 - 10:20 AM)			
10:30 - 11:30 AM	Scholarship Incubator and Workshop concurrent sessions		
	<p>Scholarship Incubator Session 1: Activism, Intersectionality, and Queer Theories Across STEM Fields</p>	<p>Workshop 1: Science Teaching for Justice in Unjust Times</p> <p><i>Sule Aksoy, CUNY Graduate Center</i> <i>Marijke Hecht, Ohio State University</i> <i>Matthew Weinstein, University of Washington</i></p>	<p>Workshop 2: Talk it Out: Modeling A Student Debate on Environmental Issues</p> <p><i>Ashli Wright, Florida International University</i> <i>Alexander Eden, Florida International University</i></p>

	<p>1A. Building power in student organizing: Affect and friendship in physics departments</p> <p><i>Emma McKay, McGill University</i></p> <p>1B. Intersectional experiences of queer scholars of color in STEM</p> <p><i>Nuria Jaumot-Pascual, TERC</i> <i>Lisette Torres-Gerald, TERC</i> <i>Maria Ong, TERC</i></p> <p>1C. Queerness in STEM: A review of federally funded research grants</p> <p><i>George Schafer, Drexel University</i></p>	<p><i>Rachel Ruggirello, Washington University in St. Louis</i> <i>Joi Merrit, James Madison University</i> <i>Regina Suriel, Valdosta State University</i> <i>Amal Ibourk, Florida State University</i></p> <p><i>Abstract: Given the current pressures at local and state levels to eliminate diversity, equity, and inclusion (DEI) language and practices from classrooms at all educational levels, we aim to bring practitioners, teacher educators, and experienced and early-career scholars to examine artifacts critically and reflect on their implementation in changing contexts. This workshop will provide participants with opportunities to work through these challenges and discuss possibilities in creatively insubordinate ways. Drawing from critical race theory frameworks, we will identify resources and approaches for conducting activist work in our educational contexts.</i></p>	<p><i>Abstract: This is an interactive research/practice workshop in which participants will model a debate format that engages discourse on environmental social justice issues. This debate activity can be adapted for secondary and post-secondary student populations. Participants will establish debate norms, partake in a brief debate on environmental issues, and engage in a reflection. Educators will leave the workshop session with evidenced-based strategies for science communication for environmental issues through a social justice lens.</i></p>
11:45 - 12:45 PM	Wondering and Workshop concurrent sessions		
	<p>Wondering Session 4: Complicating Inclusion through Intersectional/ Queer/Trans Theories</p>	<p>Workshop 3: Let the Critters Tell You a Tail: Data Analysis and Visualization Through Social Fiction Research</p> <p><i>Amanda Garner, University of Tennessee</i></p>	<p>Workshop 4: Ethnodance and Photovoice: Arts-Based Approaches Toward Liberatory Science Identity Authoring</p> <p><i>Mindy Chappell, Portland State University</i></p>

	<p>4A. Using queer approaches in designing affirming learning environments for LGBTQIA+ identifying youth</p> <p><i>Sarah Radke, Concord Consortium</i> <i>Jennifer Kahn, University of Miami</i> <i>Lisa Hardy, Concord Consortium</i></p> <p>4B. Critiquing and complicating inclusion: Queer theory, trans tensions, and intersectionality in science education</p> <p><i>Ren Rende, University of Nebraska at Omaha</i> <i>Gray Wright, University of Missouri</i></p>	<p><i>Abstract:</i> Science has traditionally been expressed as absolute, positivist, and quantitative. This is a very elitist view that keeps diverse groups out of STEM fields. This workshop is focused on analyzing data using social fiction research rooted in Critical Pedagogy of Place for practitioners. Participants will experience analyzing data through a qualitative lens, create short oral narratives from animal perspectives, and co-create a lesson outline. The workshop will explore inclusiveness on two levels: through arts-based data analysis and through exploring our relationships with the injury of place and how to live sustainably within it. The goal is to challenge traditional views of “doing science” and start a conversation about doing science in a way that is more inclusive and diverse.</p>	<p><i>Abstract:</i> This workshop aims to illustrate how one can use ethnodance, an embodied representation of ones’ narrative via dance and photovoice, a methodological approach underpinned by theoretical components of “feminism; Paulo Freire’s notion of critical consciousness; and participatory documentary photography” (Latz, 2017, p. 27), to construct and explore one’s science identity authoring in more unbounded and liberatory ways that can position research findings as catalysis to “positive change” towards addressing issues and needs illuminated by participants as active instead of “passive subjects of other people’s intentions and images” (Lats, 2017, p. 43). Through this performative workshop participants will explore the affordances of arts-based approaches in the study of science identity as a step toward equitable and liberatory research in science education.</p>
Catered Lunch (12:45 - 1:45 PM)			
2:00 - 3:30 PM	Wondering concurrent sessions		
	Wondering Session 5: Unsettling Nature of Science	Wondering Session 6: Decolonizing Identities, Partnerships and Place-Based Science Education	Wondering Session 7: Questioning Futurities in STEM and Re-Imaginations

	<p>5A. Epistemic (in)justices in observations, risks and values in science (education)</p> <p><i>Jenny Tilsen, University of Minnesota</i></p>	<p>6A. Interrogating "mestizaje" and "Latinidad" in science education: A decolonial antiracist-feminist Analysis</p> <p><i>Andrés Espinoza-Cara, Universidad Nacional de Rosario-Ministerio de Educación de Santa Fe-Género en Ciencia y Tecnología(GenCyT)</i></p> <p><i>Jaquelina Schmittlen-Garbocci, University of Tennessee, Knoxville-Centro Hispano</i></p>	<p>7A. Robots, gardens & virtual worlds: Interrogating futurity of STEM learning</p> <p><i>Colin Hennessy Elliott, Drexel University</i></p> <p><i>Sarah Radke, Concord Consortium</i></p>	<p>8A. Social justice as a hook or science content as a lens</p> <p><i>Lenora Crabtree, University of North Carolina Charlotte</i></p>
	<p>5B. How can aesthetics inform nuanced teaching and learning of Nature of Science?</p> <p><i>Rachel Garcia, Ohio University</i></p>	<p>6B. Critically examining partnerships between science/environmental educators and Indigenous communities</p> <p><i>Emily Reigh, University of California, Santa Cruz</i></p> <p><i>Marijke Hecht, The Ohio State University</i></p>	<p>7B. Reimagining and desettling a Perspectives on Science course</p> <p><i>Christina Baze, University of Arizona</i></p>	<p>8B. Exploring the integration of DEIJ in science curriculum</p> <p><i>Ron Gray, Northern Arizona University</i></p> <p><i>Yue Bai, University of Connecticut</i></p> <p><i>Todd Campbell, University of Connecticut</i></p>
	<p>5C. Driving necessary shifts to problem-based learning in the science classroom</p> <p><i>Shanna Lillis, The Conservatory School</i></p>	<p>6C. Indigenous knowledge & place-based education to decolonize high school science learning</p>	<p>7C. Community in the classroom</p> <p><i>Andrea Frank, St. Cloud State University</i></p> <p><i>Felicia Leammukda, St. Cloud State University</i></p>	<p>8C. Scaling up after school professional development: Considering hierarchical barriers to adaptation</p> <p><i>Heidi Cian, MMSA</i></p>

		<i>Molly German, Gridley High School</i>		
BREAK/COFFEE (3:30 - 3:45 PM)				
3:45 - 4:45 PM	Scholarship Incubator and Workshop concurrent sessions			
	<p>Scholarship Incubator Session 2: Centering Indigenous and Black Epistemologies toward Restorying and Liberatory Practices</p> <p>2A. Re-imagining relationship with the land: Restorying interdisciplinary learning through a sixth-grade river trip experience</p> <p><i>Lily Yan, Michigan State University</i> <i>Breanne Litts, Utah State University</i></p> <p>2B. Re-humanizing practices at the intersection of formal and informal science education: A restorying inspired by Inuit-led environmental stewardship and figurings of selves inside an urban science club</p> <p><i>Jrène Rahm, Université de Montréal</i></p> <p>2C. Sowing seeds: Examining outdoor programs and their liberatory practices that legitimize Black epistemology in science</p>	<p>Workshop 5: What's in a Meter Squared? Connecting to Local Place Using our Senses and Questioning our Place as Humans in the Natural World</p> <p><i>Casey Ortbahn, Ohio State University</i> <i>Regina Suriel, Valdosta State University</i> <i>Marjke Hecht, Ohio State University</i></p> <p><i>Abstract:</i> This virtual workshop aims to disturb settled expectations in science education by questioning the human vs. nature binary that underpins Western philosophies and discussing Indigenous philosophies that see humans and nature as inseparable. Building on experiences from the 2023 SEEDS Summer Institute Without Walls held in La Fortuna, Costa Rica, this workshop will compare Western anthropocentric philosophies with what we learned from the indigenous Maleku people of Costa Rica, who described their philosophy as centering God, followed by nature, and then humans. During this workshop, participants will use their senses to explore a 1x1m grid plot and create a 3D sensory map. Participants will also discuss ecological interactions and how we, humans, interact with the more-than-human world around us.</p>		

	<p><i>Brandi Cannon-Force, Stanford University</i> <i>Janet Carlson, Stanford University</i></p>	
5:00 - 6:00 PM	Workshop concurrent sessions	
	<p>Workshop 6: (TRANS)forming Gender-Inclusive Science Education: Ideas for Inclusivity from Trans and Nonbinary Science Teachers</p> <p><i>Ren Rende, University of Nebraska at Omaha</i></p> <p><i>Abstract:</i> The teaching of science in K-12 schools has long been criticized as propagating oppression for students who do not conform to entrenched norms of gender, sex, and sexuality. Despite advances in LGBTQ+ inclusive science education, implementation suffers from lack of cohesive guidelines for pedagogy and practice, particularly for transgender and nonbinary youth. This workshop presents the TRANS Framework, developed from a trans-led study involving ten trans and nonbinary science teachers, for science teaching through a trans-informed lens. Participants will learn strategies for adapting their teaching practices to better include transgender, nonbinary, and gender-creative youth.</p>	<p>Workshop 7: Counter-Mapping with Desires for the Pluriverse</p> <p><i>Kristal Turner, University of Calgary</i> <i>Jennifer D. Adams, University of Calgary</i> <i>Kristen Schaffer, Mount Royal University</i> <i>Sarah El Halwany, Université de l'Ontario Français</i> <i>Sophia Marlow, University of Calgary</i></p> <p><i>Abstract:</i> We seek to better understand racialized students' desires as well as uncover the political contexts "in which some positions and perspectives are privileged at the expense of others" (Gokee et al., 2020, p. 826). Mapping to counter the dominant narrative provides the potential to make these desires apparent and thereby present a glimpse at the pluriverse.</p>
BREAK (6:00 - 6: 30 PM)		
6:30 - 8:00 PM	<p>Annual General Meeting</p> <p>Town Hall 2: Pláticas y Fascism in the Science Education Landscape</p> <p><i>Michelle Salgado, Exploratorium Teacher Institute</i></p>	

	<p><i>Amal Ibourk, Florida State University</i> <i>Lama Jaber, Florida State University</i> <i>Sarah Michaels, Clark University</i> <i>Alberto J. Rodriguez, University of Houston</i></p> <p><i>Abstract:</i> Our work has brought us together amidst a continued rise in fascism impacting the science education landscape to engage in “pláticas” or conversations across our research and professional contexts. We each experienced this rise in fascism differently, some more directly than others depending on our positionalities and geographical locations across the United States. We view storying and sitting with tension and vulnerability as emergent, generative action toward future justice work. Through this town hall, we aim to emphasize the power of story, and the need to gather and witness the impact of oppressive forces on our personal and professional lives, as well as our agentic responses to counter such forces.</p>
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Sunday, January 21 (Times are in MST)

8:30 - 9:30 AM	Wondering and Workshop concurrent sessions	
	<p>Wondering Session 9: Teaching about Climate Responsibility and Death</p> <p>9A. Native knowledge structures’ impact on climate responsibility</p> <p><i>Devonian Locke, TERC</i></p> <p>9B. What is the responsibility of science education to inform and prepare students to know and understand death?</p> <p><i>Sonya Martin, Seoul National University</i></p>	<p>Workshop 8: Workshop Your Practice! A Relational-Material Invitation for Living-Doing Otherwise in Science Education</p> <p><i>Sarah El Halwany, Université de l’Ontario Français</i> <i>Christie Byers, George Mason University</i></p> <p><i>Abstract:</i> This workshop will engage participants in examining their own practice in science education through the invitations made possible by “the co-sensing with radical tenderness” deck of cards, written by Dani d’Emilia and Vanessa Andreotti. These invitations are part of a larger project for ‘hospicing modernity’ (de Oliveira, 2021) whereby attendees are invited to co-sense and become accountable to modern colonial politics and day-to-day practices in science education that have turned habitual, natural and desirable. By engaging with the cards, materials, walks, and one another,</p>

	<p><i>Rachel Ruggirello, Washington University in St. Louis Institute for School Partnership</i></p>	<p>we hope that participants will experience first-hand how to activate bodily and affective capacities for radical openness to care, complexity and wonder in science education.</p>	
<p>9:45 - 10:45 AM</p>	<p>Scholarship Incubator and Workshop concurrent sessions</p>		
	<p>Scholarship Incubator Session 3: Reckoning with Systemic Racism, Whiteness, and Racializing Hierarchies in Science Teacher Education</p> <p>3A. Supporting socially-just STEAM/science teachers' practices through rightful presence</p> <p><i>Ti'Era Worsley, The University of North Carolina at Greensboro</i> <i>Justina Jackson, Georgia Institute of Technology, Center for Education Integrating Science, Mathematics, and Computing (CEISMC)</i> <i>Katie Boice, Georgia Institute of Technology, CEISMC</i> <i>Meltem Alemdar, Georgia Institute of Technology, CEISMC</i> <i>Désirée Whitmore, Exploratorium Teacher Institute</i> <i>Sarah C. Porter, The University of North Carolina at Greensboro</i></p>	<p>Workshop 9: Walking, Noticing, and Wondering: Ethical Field-Based Science through Learning in Places</p> <p><i>Jordan Sherry-Wagner, University of Washington</i> <i>Megan Bang, Northwestern University</i> <i>Carrie Tzou, University of Washington</i> <i>Breigh Rhodes, Northwestern University</i> <i>Shirin Vossoughi, Northwestern University</i> <i>Anna Lees, Western Washington University</i></p> <p><i>Abstract:</i> This workshop engages participants in facilitated sensemaking around the practice of wondering walks as grounded within the Learning in Places project aimed at supporting complex socioecological sensemaking and ethical deliberation and decision-making practices with youth, families, educators, and communities. Participants will learn about the role of place-based noticing, wondering, and ethical deliberation within Learning in Places, and be supported in understanding how routine outdoor activity supports sophisticated</p>	<p>Workshop 10: Appetizers for Humanity: Equitable Bite-Sized Hands-On Science Activities to Challenge Educator Perspectives</p> <p><i>Desiré Whitmore, Exploratorium Teacher Institute</i></p> <p><i>Abstract:</i> Equitable science teaching requires understanding and empathy of students' experiences. Explore phenomena-based hands-on science activities designed to support understanding of the Next Generation Science Standards that can also lead to conversations about our explicit and implicit biases and expectations of students, while developing greater awareness of the factors that affect how students show up in the classroom. These activities are easy to implement, use everyday simple materials, and are useful for work with both teachers and students.</p>

	<p>3B. Appropriation of culturally relevant teaching: Demystifying whiteness in science education</p> <p><i>Curtis O'Dwyer, University of Wisconsin–Madison</i></p> <p>3B. Sensitizing to diversity: Disturbing racializing hierarchies in science teacher education</p> <p><i>Katie Kirchgasser, University of Wisconsin–Madison</i></p>	<p>inquiry across disciplinary domains. Within this space, we elevate our designs for ethical wondering with people, places, and more-than-humans to demonstrate how wondering walks can desettle powered hierarchies across multiple levels. Specific to this workshop, we will focus on how our design contributes to refiguring relationships between humans and the rest of the natural world, as well as between adult educators and youth learners.</p>	
BREAK/COFFEE (10:45 - 11:05 AM)			
11:10 - 12:40 PM	Scholarship Incubator and Wondering concurrent sessions		
	<p>Scholarship Incubator Session 4: Re-Examining What Counts as 'Science' Language, Families and Communities</p> <p>4A. Students' reflections about welcoming translanguaging in middle school science classrooms</p> <p><i>Caitlin Fine, Metropolitan State University of Denver</i> <i>Melissa Braaten, University of Colorado Boulder</i></p>	<p>Wondering Session 10. Centering Emotions and Creativity for Equity in Science Education</p> <p>10A. What's grief got to do with it? Seeking stories and Black Joy in the outdoors</p> <p><i>Charissa Jones, Oregon State University</i></p> <p>10B. The politics of teaching: Creative insubordination</p>	<p>Wondering Session 11. Issues of Power in Learning and Assessment in Postsecondary Science Education</p> <p>11A. The influence of power on organic chemistry learning</p> <p><i>Ira Caspari-Gnann, Tufts University</i> <i>Chinwendu Igboekulie, Tufts University</i></p>

	<p>4B. How can we build science learning and assessment with students and families?</p> <p><i>Clarissa Deverel-Rico, University of Colorado Boulder</i> <i>Erin Marie Furtak, University of Colorado Boulder</i></p> <p>4C. Expanding notions of what it looks like to be a 'science family'</p> <p><i>Julianne Wenner, Clemson University</i></p> <p>4D. They're my community too: Examining bidirectional critical relationality within a community-based informal stem program</p> <p><i>Ti'Era Worsley, The University of North Carolina at Greensboro</i></p>	<p><i>Kara Haas, Michigan State University</i> <i>Grace Tukurah, Michigan State University</i></p> <p>10C. Centering science teachers' voices and experiences in a contentious time</p> <p><i>Shannon Davidson, University of Alabama</i></p>	<p>11B. Exploring the tenets of critical pedagogy within an introductory undergraduate biology course at a Hispanic serving research institution</p> <p><i>Corin Gray, University of Arizona</i> <i>Lisa Rezende, University of Arizona</i> <i>Susan Hester, University of Arizona</i> <i>Angel Pimentel, University of Arizona</i> <i>Ramin Yadegari, University of Arizona</i></p> <p>11C. Supporting students who struggle with ungrading</p> <p><i>Sara Dozier, CSU Long Beach</i></p>
Catered Lunch (12:45 - 1:45 PM)			
1:50 - 2:50 PM	Scholarship Incubator and Workshop concurrent sessions		
	<p>Scholarship Incubator Session 5: Grappling with Identities, Ideologies, and Epistemologies Toward Culturally Relevant and Ecojustice Approaches</p>	<p>Workshop 11: Critical Stakeholders: An Anti-Racist and Anticolonial Methodology for the Critical Liberatory Presencing of Other-ed Kin for the Disruption of Settler Colonial Dominance in Science Education</p> <p><i>Anastasia Sanchez, University of Washington</i></p>	

	<p>5A. Identities and positionalities: The first steps towards the establishment of equity and social justice in science education</p> <p><i>Alberto J. Rodriguez, University of Houston</i> <i>Marianela Navarro Camacho, University of Costa Rica</i></p> <p>5B. Engaging science teachers through an ecojustice education framework to critically explore science education: A conceptual analysis</p> <p><i>Rita Ortiz, University of South Florida</i> <i>Allan Feldman, University of South Florida</i></p> <p>5C. Grappling with the sociopolitical in science teacher education</p> <p><i>Allison Metcalf, Florida State University</i> <i>Lama Jaber, Florida State University</i> <i>Stephanie Batres-Spezza, University of Illinois, Chicago</i> <i>Shannon Davidson, University of Alabama</i></p>	<p><i>Kelsie Fowler, University of Washington</i></p> <p><i>Abstract:</i> The disrupting of westernized science education’s ethnocentrism, purposely designed to be void of cultural, and consequential relativism, calls for a collective commitment and diligence to anti-colonial and anti-racist pedagogical approaches of radical epistemic heterogeneity (Warren et al., 2020). Embracing this call, we invite workshop participants to join us, in thick solidarity (Liu & Shange, 2018) with Other-ed human, and more than human, communities, to explore the transformative possibilities of employing a stakeholders methodology guided by the Social Focus framework (Sanchez, in press) in the designing and development of science instruction and materiality. A Critical Stakeholders methodology is in opposition and refusal of normative conceptualizations of stakeholders—as social actors mirroring, enacting and ensuring the perpetuity of white supremacy systems of consumerism and conservation—to presence “what is invisible noticeably absent so that it can be remembered and missed” (Ahenakew, 2016, p. 333). Through a Social Focus stakeholders methodological approach science education is (re)structured and (re)purposed to prioritize the critical liberatory presence of Black Indigenous and People of the Global Majority (BIPGM), LandAirWaterStars (Sanchez, in review) and multispecies kin, through the centering of restorative justice and rightful representation to cultivate student and community self-determination and collectivism. In this workshop we will ground ourselves in knowledge about the pervasiveness of white epistemic dominance in science education that serve colonial logics and agendas of progress, thereby eradicating pluralistic worldviews and ways of knowing. We will also reflect and collaborate to identify and create expansive opportunities to engage a critical stakeholders methodology. As a collective we will culminate our session with the sharing of new educational imaginaries for a science education Otherwise that destabilizes foundations of colonial science education, by seeding content with matters of consequentiality, and pluralistic worldviews and ways of knowing.</p>
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3:00 - 4:00 PM

Town Hall 3: Can Higher Education Respond to the Calls for Social Justice STEM Reform?

Randy Yerrick, Fresno State
Rolston St. Hilaire, Fresno State

Abstract: Universities can often operate in isolation from their constituents, their students, their supporters and sometimes ironically even in isolation or opposition to their own mission or intentions. This Town Hall is comprised of attendees to the SEEDS Summer Institute (SEEDS-SI) who collaborated throughout the institute with the intention of impacting their home institution upon their return. The Panel is interested in strategizing ways to move our home institutions in vital directions toward social justice outcomes within the course instruction, student service, and community impact. We are reporting the extent to which our respective institutions received, adopted, supported, invested in, and extended contending intentional shifts to move colonial and canonical views of math and science.

Scholarship Incubator Full Abstracts

(1) Activism, Intersectionality, and Queer Theories Across STEM Fields

1A. Building power in student organizing: Affect and friendship in physics departments

Emma McKay, McGill University

How do student organizers build power? In my ten years of organizing in university physics departments, I have come to believe that it is through whole-body affective experiences. In these experiences, people learn how to live differently and build deep, meaningful friendships, which further facilitate the building of power. In my proposed dissertation work, I conduct affective anarchist ethnography with my friends and co-organizers to try to understand together more deeply and practically how we can live in ways that resist Empire.

1B. Intersectional experiences of queer scholars of color in STEM

Nuria Jaumot-Pascual, TERC

Lisette Torres-Gerald, TERC

Maria Ong, TERC

STEM fields are often assumed to be neutral, impersonal, depoliticized contexts where personal or social identities, such as one's sexual orientation and racial/ethnic identity, are irrelevant (Mattheis et al., 2019). However, the settled expectations and norms imposed in such spaces often reinforce heteronormativity. "Discourses of achievement [that] perpetuate a normalization of White middle-class norms" (Caraballo, 2019, p. 28) often result in the exclusion of diverse perspectives in STEM and STEM education.

1C. Queerness in STEM: A review of federally funded research grants

George Schafer, Drexel University

Queer people in America are underrepresented in multiple ways including acquisition of jobs, persistence in higher education, and research that is focused on queer identity, with such underrepresentation especially prominent in STEM fields. This study seeks to understand how the National Science Foundation (NSF) has historically supported queer people through the award of research funding (grants). A systematic review of research grants was conducted, using a 3-tier set of criteria. Through document analysis, this study found that (especially before the 2015) there are very few funded queer-focused research grants. Drawing from these results and extant literature on the intersections of queerness and STEM, the author argues for a significant increase in NSF's support of LGBTQ2IA+ individuals in America.

(2) Centering Indigenous and Black Epistemologies toward Restorying and Liberatory Practices

2A. Re-imagining relationship with the land: Restorying interdisciplinary learning through a sixth-grade river trip experience

Lily Yan, Michigan State University
Breanne Litts, Utah State University

Anthropocentrism is a form of settled expectation that shapes the current notions of science in formal education, which privilege the human-dominant worldview through marginalizing the diverse perspectives of how people understand, relate to, and live with the land. In our work as a team of Indigenous and non-Indigenous researchers, educators, and designers, we explored: how do learners express relationship with the land in the restorying of their river trip experience? We present three cases that illustrate how sixth graders demonstrate different forms of interacting and relating with the land. Our findings contribute insights into how interdisciplinary approaches to land-based science learning disrupt the dominant ways of knowing and interacting through restorying.

2B. Re-humanizing practices at the intersection of formal and informal science education: A restorying inspired by Inuit-led environmental stewardship and figurings of selves inside an urban science club

Jrène Rahm, Université de Montréal

What would re-humanizing policies, practices and measures look like that celebrate the full humanity at the intersection of formal and informal science education? What could such a decolonization bring to the surface? What kind of “shiftings” would be needed were we to fully embrace heterogeneity, multiplicity and profusion? I engage with these questions through a case study of an Inuit-led environmental stewardship project in Nunavut conducted in collaboration with its leaders and local communities, and by resituating myself in an urban youth science club and its co-creation projects. I focus on heterogenous, relational, and collective forms of participation, knowing, and becoming and its conceptual and methodological implications in light of re-humanizing policies and practices in science education.

2C. Sowing seeds: Examining outdoor programs and their liberatory practices that legitimize Black epistemology in science

Brandi Cannon-Force, Stanford University
Janet Carlson, Stanford University

Science knowledge held by African Americans has been delegitimized because it doesn't align with western science epistemology. Today, outdoor education programs (OEP) who target Black populations engage with science through community, ancestral skills, and reconnection with the past. These are not seen as typical ways of connecting with and doing science. This is a qualitative study where I conducted interviews and content analysis of program websites and documents of OEP across the country. Black OEP, specifically, expands what counts as science and who is considered a scientist through deeper science educational practices. Centering Black liberation in educational programs is possible. It challenges understanding around the diversity of knowledge and how we can view Black participants as knowledge contributors and consumers of science.

(3) Reckoning with Systemic Racism, Whiteness, and Racializing Hierarchies in Science Teacher Education

3A. Supporting socially-just STEAM/science teachers' practices through rightful presence

Ti'Era Worsley, The University of North Carolina at Greensboro

Justina Jackson, Georgia Institute of Technology, Center for Education Integrating Science, Mathematics, and Computing (CEISM)

Katie Boice, Georgia Institute of Technology, CEISM

Meltem Alemdar, Georgia Institute of Technology, CEISM

Désirée Whitmore, Exploratorium Teacher Institute

Sarah C. Porter, The University of North Carolina at Greensboro

DEI-focused initiatives and groups have recently arisen to try and tackle long standing issues of systemic racism within the classroom, but they have also simultaneously been under attack. Teachers are grappling with how to address issues of social justice (SJ) in classrooms and are left with minimal resources on how to do so. Furthermore, the majority of science teachers are white women, and likely have had little or no opportunities to discuss or engage with issues related to race and racism, particularly in their teacher education programs. This proposal looks at two professional development (PD) programs focused on developing SJ educators to implement SJ practices within their respective educational learning communities. We frame our work in rightful presence (RP), and through qualitative research methods came to identify two key factors. First how teachers developed an understanding of RP and secondly how RP was established throughout the PD.

3B. Appropriation of culturally relevant teaching: Demystifying whiteness in science education

Curtis O'Dwyer, University of Wisconsin–Madison

Although science was used to formalize, legitimize and operationalize racism in the United States, current reform efforts, teacher education programs, and pedagogical practices fail to adequately address the impact this history has on Black students' experiences and outcomes in science today. Critiques of this issue recommend integrating culturally relevant pedagogy in science education; however, science educators experience unique difficulties translating the theory to practice due to acultural beliefs about science. Aculturalism, as a colorblind ideology, obfuscates contemporary issues stemming from scientific racism, similar to whiteness. Thereby, this study examines how whiteness can hinder the possibility of culturally relevant pedagogy in science classrooms and limit the fulfillment of equity and diversity commitments outlined in the Next Generation Science Standards.

3B. Sensitizing to diversity: Disturbing racializing hierarchies in science teacher education

Katie Kirchgasser, University of Wisconsin–Madison

This paper historicizes dangers in efforts to develop science teachers sensitive to diversity. I examine how teacher education tools produce and regulate difference in attempts to reform the feelings of target student populations. The study compares reforms to sensitize U.S. science teachers to the “culturally deprived” (1960s–1970s) versus “culturally diverse” (1990s–2000s). I juxtapose sensitizing tools from both eras to map what has shifted from desegregation to equity reforms. The analysis explores how techniques for sensitizing teachers reinscribe racializing

premises—separating a self-improving teaching self from students pathologized as needing affective development. I argue that tools for regulating teacher and student affect carry expectations of who is currently excluded and must be included through that act of affective regulation.

(4) Re-Examining What Counts as 'Science' Language, Families and Communities

4A. Students' reflections about welcoming translanguaging in middle school science classrooms

Caitlin Fine, Metropolitan State University of Denver

Melissa Braaten, University of Colorado Boulder

Science education scholars have been exploring translanguaging as an equitable classroom pedagogy (García & Li Wei, 2017; Pierson et al., 2021). Less is known about students' views of translanguaging in science classrooms. In this manuscript, we employ equity-as-access and equity-as-transformation lenses (Author, 2023a) to investigate sixth-grade students' perspectives. Findings are based on audio transcripts from eight student focus groups and 105 written questionnaire responses. Findings suggest that 6th-graders have complex, nuanced views about translanguaging. They explained that multilingual science tasks allowed access through clarifying words and represented a potentially transformative social justice imperative. However, students also expressed their savvy understandings of the power-laden values of schooling and their language-use decisions. Findings highlight implications for teachers and curriculum designers.

4B. How can we build science learning and assessment with students and families?

Clarissa Deverel-Rico, University of Colorado Boulder

Erin Marie Furtak, University of Colorado Boulder

Culturally sustaining approaches emphasize the importance of centering the interests and identities of those long held at the margins of school and STEM education. We have developed an approach to start science assessment design with the voices of learners and families. We seek to disrupt traditional assessment design practices by centering the experiences of students and families through what we call community listening sessions, or spaces in which school district leaders and researchers engage directly with learners' and communities' ideas and interests. We present findings from our initial listening session, and explore next steps in building science assessment directly with learners and families.

4C. Expanding notions of what it looks like to be a 'science family'

Julianne Wenner, Clemson University

Families are significant influences on children's interest, engagement, and aspirations (IEA) in science. However, research exploring family impact on children's IEA in science rarely seeks families' voices and often rely on 'settled' notions of 'what counts' as science. Through focus groups with forty adults, this study explored what families are doing to support their children's IEA in science. Supports reported include: responding to in-the-moment curiosities and questions; following up on questions and wonders with resources; and, making sense of everyday science

activities in the home. Familial, linguistic, and aspirational capital were the most prominent resource types in the data. This study contributes to the field by disrupting ‘settled’ ideas of what it means to be a ‘science family.’

4D. They’re my community too: Examining bidirectional critical relationality within a community-based informal stem program

Ti’Era Worsley, The University of North Carolina at Greensboro

What does it mean to have a community-based STEM learning environment centered in Blackness? A space where youth and their informal STEM educator (ISE) can express themselves through cultural colloquialisms (i.e. music, cultural references, African American vernacular language) that in many other dominant culture settings they exist in, are misunderstood and deemed deviant. This proposal aims to understand how the Black Love framework supports the bidirectionality of critical relationality between Black youth and a Black ISE. Embedded in participatory design research, I take a grounded theory approach to identify and analyze emerging patterns that included the development of STEM-based trust and youth humanization of the ISE.

(5) Grappling with Identities, Ideologies, and Epistemologies Toward Culturally Relevant and Ecojustice Approaches

5A. Identities and positionalities: The first steps towards the establishment of equity and social justice in science education

Alberto J. Rodriguez, University of Houston
Marianela Navarro Camacho, University of Costa Rica

Herein, we share findings from a mixed methods research project with 16 Costa Rican pre-service high school science teachers, who participated in our project for the last year and a half of their professional preparation. Our study focuses on improving the self-efficacy of future teachers in implementing culturally and socially relevant science/STEAM curriculum. In this presentation, we will share insights gathered on the participants’ ethnic/cultural and identity development (positionality), and on this construct’s potential impact on future teachers’ abilities to establish culturally inclusive and socially relevant science/STEAM classrooms.

5B. Engaging science teachers through an ecojustice education framework to critically explore science education: A conceptual analysis

Rita Ortiz, University of South Florida
Allan Feldman, University of South Florida

To address recent critiques of how natural systems are positioned within the Next Generation Science Standards, teachers and students can be provided with a deeper examination of environmental topics to better understand reasons to solve issues of our ever-changing environment. In this conceptual paper, I argue for the importance of providing science teachers with an alternative epistemic orientation of science in comparison to the dominant narrative of Western modern science. Ecojustice education can help provide a framework to examine the relations between people and Earth, and how they have resulted in the ecological crisis we face today. I outline a theoretical

framework and ways to incorporate it in science teacher education, including decolonizing methods and through collaborative learning.

5C. **Grappling with the sociopolitical in science teacher education**

Allison Metcalf, Florida State University

Lama Jaber, Florida State University

Stephanie Batres-Spezza, University of Illinois, Chicago

Shannon Davidson, University of Alabama

In the U.S., far-right stakeholders and politicians have gained publicity and momentum as they seek to redefine public education in ways that silence and disempower teachers by attacking critical theories and equitable pedagogies. As teacher educators, we must support preservice teachers to navigate this political climate; it is therefore imperative to help them develop political clarity. Working toward political clarity, however, is thick with complexities and emotions as PSTs grapple with their own experiences, ideologies, and responsibilities. In this study, we use poetic inquiry to explore four preservice teachers' grapplings as they reckon with the sociopolitical realities of education in Florida, their emotions about these realities, and what they feel to be their responsibilities as educators.

Wondering Full Abstracts

(1) Considerations for Environmental Justice through Place-Based Science Education

1A. **How might place-based environmental justice curricula resonate with students and teachers in other places?**

Sarah Stapelton, University of Oregon

Environmental justice is inextricably embedded in place contexts. In our work to build a science unit that centers environmental justice, we have chosen to focus on local community issues and organizing, spearheaded by an environmental justice non-profit with whom we are partnering. This wondering explores the limits and affordances of this deeply place-based curriculum creation. More specifically, we wonder for whom and for what communities our curriculum will resonate in and beyond our place. In other words, how transferable is place-specific, environmental justice science curricula?

1B. **Seaweed farming in Belize: Ecojustice authentic science**

Allan Feldman, University of South Florida

Rita Ortiz, University of South Florida

What are the possibilities of engaging students in authentic science and engineering that is guided by an ecojustice framework? This wondering poses studying students' and teachers' engagement in a project to be developed that focuses on seaweed farming in a rural community in Belize. The community is facing pressure from upscale development that accommodates wealthy tourists from the Global North. Seaweed farming is a new industry being developed by community members to increase self-reliance and resist development. The project would be

developed in collaboration with members of seaweed farming cooperatives and local teachers. Students would investigate topics drawing on the farmers practical knowledge to test ways to improve the growing and processing of seaweed.

1C. What could doing better look like? Disrupting and desettling elementary preservice teacher education with community based environmental justice learning experiences

Lauren Wagner, Florida State University

Ronan Rock, University of Illinois Chicago

This wondering informs an approach teacher educators can implement through science methods courses to support elementary preservice teachers to develop a stronger understanding of the relationship between communities and the burdens of environmental exploitation. This involves teacher educators dedicated to disrupting systems and examining settled expectations: ways of knowing and practices that continue to perpetuate impacts of environmental injustice. These learning experiences are especially critical for elementary preservice teachers, as previous scholarship suggests they often struggle to identify the environment as a source of challenges and injustice in our society. As such, teacher educators can develop interdisciplinary and inquiry based research projects through methods courses that help preservice teachers examine community issues from a scientific and justice oriented lens. For example, environmental challenges such as pollution, climate change, and tree equity can draw upon preservice teachers' funds of knowledge about local injustices, and provide an opportunity for that knowledge to foster agency as a force of change. By immersing them in awareness of these issues, preservice teachers can become equipped to approach science for our youngest learners by disrupting previous ways of knowing about communities and environmental issues. Moving forward, we can then focus on the reparations and reconstruction of systems in our society that have historically harmed communities in the past.

(2) Questions of Success, Identity, and Discourse for Equity in Science Education

2A. The experiences of successful international women in science

Jonathan Hall, California State University, San Bernardino

Girls and women navigate contexts often detrimental to their science identity development. This is an ongoing problem that educational systems should address and disrupt. For girls, science experiences are often shared from a deficit perspective, which helps identify harmful science spaces, yet is limited in providing insight into building supportive spaces. Understanding the science identity development of successful international women in science addresses this issue. The research question is, What are the experiences of successful international women in science? With each participant, three interviews explored aspects of their science identity. The following two initial themes emerged: participants were "anthropologists" of their science figured worlds and their contributions were recognized. Implications for science/education educators will be discussed.

2B. The excluded black male STEM educators

Samuel Katende, University of Houston

Black males make up less than 2% of US teachers, with an even smaller representation in STEM subjects. Studies indicate a positive correlation between teachers' race/gender and students' expectations. The experiences of Black male immigrant educators are often overlooked, and the interchangeable use of "Black" and "African American" further neglects their unique perspectives. It remains uncertain if their experiences are adequately considered in research. Questions arise regarding the ability of Black immigrant teachers to relate to the culture and language of Black students, their motivations, and the political nature of their roles. There is a need to challenge expectations, recognize diverse experiences, and create an equitable and diverse education space for all Black teachers.

2C. Approaching equity through discourse: A wondering on equity and talk

Sierra Morandi, Florida State University

The Framework for K-12 Science Education and NGSS have framed equity and diversity as singular ideas relegated to a chapter or appendix and fail to integrate the idea of equity throughout the entire document and standards. This leads to a failure of the implementation of the ideas of equity when educators are looking to use the NGSS standards or even teach from NGSS-aligned curricula that do not include the necessary provisions on including equity within their instruction. With a lack of support, there is a need to bring together a tool and framework that can be used by teachers, teacher educators, and researchers to support creating authentic and equitable science experiences. This wondering focuses on the beginnings of creating a supportive framework and tool around discourses that facilitate equitable science instruction both reflecting on the explicit and implicit ways that discourse can support this larger goal.

(3) Supporting Pre-service Science Teachers' Critical Consciousness

3A. Secondary science preservice teachers' onto-epistemologies

Kate Miller, Michigan State University

I am wondering about secondary science preservice teachers' (PSTs') onto-epistemologies of science, and how their onto-epistemologies are reflected in these PSTs' thinking about teaching and learning. I venture that if a PST holds a settled onto-epistemology, this will serve as a barrier to justice-oriented science teaching (JOST); conversely, if a PST holds a desettled onto-epistemology, it will serve as an invitation towards JOST. I approach this wondering embracing decoloniality perspectives, borrowing language of settled and desettled onto-epistemologies, and working towards a vision of JOST. My wondering opens opportunities for teacher educators to attend to PSTs' understandings of diversity, equity, and social justice.

3B. Supporting the development of preservice teachers' critical consciousness

Megan Walser, Michigan State University

This Wondering is about how teacher educators can support the development of preservice teachers' (PSTs) critical consciousness. Developing critical consciousness is essential for PSTs to enact justice-oriented science teaching, because it allows them to see how systems of oppression play out in science classrooms. My Venture about this

Wondering, based on a set of interviews with novice teachers, is that seeing examples of teaching science for social justice, rehearsing a justice-oriented science unit, writing a teaching philosophy, and building a community of like-minded teachers all support the development of critical consciousness. Still, I wonder what impact each of these activities actually had, and if there are specific aspects of critical consciousness that are “more important” for teacher educators to support.

3C. Desettling elementary science teacher preparation to grapple with race

Alicia Alonzo, Michigan State University

A settled expectation of teacher education is its focus on white teacher candidates’ (WTCs’) development. This centering of whiteness causes multiple layers of harm to teacher candidates of color (TCCs) and creates missed opportunities to learn for all teacher candidates. Yet science teacher educators have a special responsibility to prepare teacher candidates to address race due to extensive racism in science. As an elementary science teacher educator, I have been thinking about the unique strengths of, and challenges faced by, elementary teacher candidates learning to teach science and wondering how an elementary teacher preparation program might provide robust, humanizing learning opportunities for both TCCs and WTCs to learn to grapple with race in science.

(4) Complicating Inclusion through Intersectional/Queer/Trans Theories

4A. Using queer approaches in designing affirming learning environments for LGBTQIA+ identifying youth

Sarah Radke, Concord Consortium

Jennifer Kahn, University of Miami

Lisa Hardy, Concord Consortium

STEM contexts are often perceived as “for boys” because they are structured according to normative, gendered roles; often leaving cis-girls and gender-expansive youth feeling they don’t “fit.” This proposal explores how queer perspectives shape meaning-making for learners and researchers/educators in STEM contexts and projects. We ask, How does attending to gender expand how we understand learning within data science? A queer lens on research into STEM (for us, gaming and data science) learning emphasizes STEM as relational, plural, and not fixed. It positions us to retrieve the stories of learning we have lost; centering them as invaluable aspects of learning such that youths’ queer positionalities are seen as an essential aspect to advancing equity in STEM teaching and learning.

4B. Critiquing and complicating inclusion: Queer theory, trans tensions, and intersectionality in science education

Ren Rende, University of Nebraska at Omaha

Gray Wright, University of Missouri

Our proposed conference session invites educators and researchers to rethink traditional paradigms in LGBTQ-inclusive science education that fail to adequately represent and account for the needs of trans and other

gender-marginalized youth. We will ask participants to challenge current theoretical, conceptual, and epistemological oversights in order to promote a broader representation of identities, and facilitate the creation of inclusive, respectful learning environments. Ultimately, our goal is to brainstorm more socially just science education practices that effectively address the unique experiences and needs of trans and other gender-creative students, particularly those with intersecting marginalized identities.

(5) Unsettling Nature of Science

5A. Epistemic (in)justices in observations, risks and values in science (education)

Jenny Tilsen, University of Minnesota

Observations are a fundamental component of scientific inquiry. Yet, observing is often an assumed process, which ends up omitting the epistemic and personal values of individuals, communities, and institutions. Building on the scholarship of science as social knowledge (Longino, 1988) and incorporating epistemic justice (Fricker, 2007) requires a commitment to ourselves and others to observe science differently as well as our role in the process. The central question of this wondering is: if the values and goals of science change, how does a taken for granted practice like observing change? Through this framing, I aim to develop different understandings to how we observe, practice, and learn science, if we choose to value justice.

5B. How can aesthetics inform nuanced teaching and learning of Nature of Science?

Rachel Garcia, Ohio University

I have been wondering about how science educators can accomplish a fruitful and joyful approach to obtaining a nuanced and critical understanding of the nature of science (NOS) by considering aesthetics. My venture is to design a place-based curriculum for teaching NOS to pre-service teachers, thus providing a third space that takes advantage of local context to create emotional connections and embodied experiences for aesthetic experience. The venture considers how to contend with unappealing aspects of science but also highlight the wonder and beauty of the discipline with a goal of developing an aesthetic taste for a kind of science and science education that is equitable and leads to increasing social justice.

5C. Driving necessary shifts to problem-based learning in the science classroom

Shanna Lillis, The Conservatory School

Great efforts have been taken to shift science curriculum standards in the U.S. to include scientific and engineering practices, yet not enough strides have been made to shift curriculum and assessment approaches to include emancipatory applications of learning through a problem-based pedagogy. Without applying science and engineering skills to real-world problem-solving, students cannot engage as active agents for change, and never learn true inquiry and twenty-first century skills. The purpose of this presentation is to discuss a wondering with the SEEDS community about methods for convincing important stakeholders of the benefits of problem-based learning in the science classroom, and to propose a research project venture that could serve as an exemplar for its larger-scale adoption.

(6) Decolonizing Identities, Partnerships and Place-Based Science Education

6A. Interrogating "mestizaje" and "Latinidad" in science education: A decolonial antiracist-feminist Analysis

Andrés Espinoza-Cara, Universidad Nacional de Rosario-Ministerio de Educación de Santa Fe-Género en Ciencia y Tecnología(GenCyT)

Jaquelina Schmittlen-Garbocci, University of Tennessee, Knoxville-Centro Hispano

This Wondering aims to highlight the problematic nature of using "Latine" and "latinidad" without critical examination. It emphasizes the need for a decolonial antiracist-feminist perspective to challenge oppressive frameworks and promote inclusivity in science education within the Latin American and Caribbean diaspora. By recognizing diverse experiences and intersections of gender, race, and colonialism, this perspective aims to dismantle existing power structures and foster equitable practices in the field.

6B. Critically examining partnerships between science/environmental educators and Indigenous communities

Emily Reigh, University of California, Santa Cruz

Marijke Hecht, The Ohio State University

Many justice-focused science educators are including traditional ecological knowledge and indigenous STEM practices in mainstream learning settings. Given this movement, we wonder how partnerships with indigenous groups can be structured through a de/anti colonial lens. In this session, we will use de/anti colonial frameworks to interrogate our own attempts to partner with indigenous communities, asking to what extent these efforts might be a "move to innocence" (Tuck & Yang, 2012). We discuss what resources and relational commitments are necessary to build reciprocal partnerships with indigenous groups and consider our responsibility in supporting the rematriation of land and redistribution of resources.

6C. Indigenous knowledge & place-based education to decolonize high school science learning

Molly German, Gridley High School

I have been learning from Indigenous educators about the ways that a Western approach to science falls short in meeting the needs of students and our non-human relatives. An Indigenous understanding of the world is built on a foundation of connectedness and reciprocity, where we consider our responsibilities to the land, water, ecosystems, and communities we belong to, rather than our individual rights. I am working to incorporate more place-based science curricula, adapted for students' local places & cultures. Students should see their science learning as a tool that can help fight for change and build a world they are proud of. I would love to hear others' perspectives and ideas about what decolonizing science education could look like.

(7) Questioning Futurities in STEM and Re-Imagining Courses and Classroom Community

7A. Robots, gardens & virtual worlds: Interrogating futurity of STEM learning

Colin Hennessy Elliott, Drexel University

Sarah Radke, Concord Consortium

Considering the empire-making machineries at work in STEM education, we wonder about the power of reimagining contexts and practices to foster youths learning that refuse current trajectories of domination and inequities as inevitable and universally valued. We draw on Benjamin's "viral justice" to interrogate three different learning contexts (robotics team, community garden, virtual world), considering the learning technologies at the center of each and what remaking inequitable systems and structures, or the machinery of STEM education, entails for each. Finally, we posit what our role as educators, researchers, and learners is to center youths' futurities through STEM for growing a more just world.

7B. Reimagining and desettling a Perspectives on Science course

Christina Baze, University of Arizona

In this Wondering session proposal, I introduce the development of a General Studies Perspectives on Science course to introduce the broader student population to a more inclusive view of science. Specifically, an existing course in the STEM Education department will be reimagined to present perspectives beyond "traditional" Western science, including community science for social justice, traditional ecological knowledge, and Indigenous knowledge systems. I seek feedback on the course redesign, specifically around framing the course topics in a way that will support student understanding of diverse perspectives without ending up being used to defend science denial and anti-scientific discourses or being dismissed as non-scientific.

7C. Community in the classroom

Andrea Frank, St. Cloud State University

Felicia Leammukda, St. Cloud State University

Research prior to the COVID-19 pandemic has heavily supported the importance of a classroom environment in which students feel as if they belong. A sense of belonging and inclusion from one's peers is a basic human need and has been found to increase a student's engagement in class and, in turn, their learning. As students return to in-person learning, deficits in social and emotional skills of students have been the focus of many teachers in the field, stressing the need for strategies that foster relationships in the classroom. This study was conducted to test whether implementing different community building activities weekly, in addition to the traditional ice breakers used during the first week of school, provided increased benefits for student sense of belonging, engagement, and learning in the tenth- grade life science classroom. The activities used in this study were developed to help students get to know one another and embrace their own individuality.

(8) Scaling and Models for Justice-Oriented Science Education

8A. Social justice as a hook or science content as a lens

Lenora Crabtree, University of North Carolina Charlotte

Should social justice be a hook we use to entice students to learn science content, or might science content provide a lens through which we and our students become more conscious of inequitable systems, our positions within those systems, and our capacities to advocate for change? This is the question at the core of this proposed wondering session. What ventures other than justice-oriented phenomenon-based approaches might support students' understanding of their world and their capacity to enact more just and equitable futures within the context of science education? It is my hope that in wrestling with these questions we might together find our way toward reimagining the role of justice in science education.

8B. Exploring the integration of DEIJ in science curriculum

Ron Gray, Northern Arizona University

Yue Bai, University of Connecticut

Todd Campbell, University of Connecticut

In this proposal we wonder about the integration of Diversity, Equity, Inclusion, and Justice (DEIJ) in science curriculum. Conventional science curricula often perpetuate hierarchical structures based on race, class, gender, sexuality, and nationality, limiting alternative perspectives and equitable possibilities. We are creating a model-based inquiry curriculum design template that centers DEIJ by engaging students in collaborative exploration, evidence gathering, and explanation construction. Our approach draws on four equity approaches: increasing access to quality science learning, emphasizing achievement and representation, expanding the definition of science, and connecting science to justice movements. By implementing this approach, science education can become more inclusive, equitable, and justice-centered, breaking barriers and fostering a more just and equitable society.

8C. Scaling up after school professional development: Considering hierarchical barriers to adaptation

Heidi Cian, MMSA

We consider how a professional development program for afterschool educators can scale in ways that allow for variations that center local assets and cultures. Specifically, we ask "What does it look like to make "human-centered adaptations" in a scaled professional development program?". We conjecture that our support materials, which erred on the side of being fully comprehensive, may have inadvertently stagnated such adaptations by centering our epistemic authority. Enlisting the support of an equity advisor, we have taken a few steps to define our equity goals and crosswalk our materials in ways that highlight opportunities for the types of adaptations we would like to encourage. But, we would like to explore more possibilities to highlight this aspect of our work.

(9) Teaching about Climate Responsibility and Death

9A. Native knowledge structures' impact on climate responsibility

Devonian Locke, TERC

The Western framework of science education is too restrictive for a rapidly changing world. Disrupting the expectations of modern institutions allows for trailblazing solutions to rise that may seem inconceivable under current epistemologies. I am wondering how the introduction of Native knowledge structures into higher education curricula could transform climate change education, specifically in terms of how we engage with the dynamics and impact of individual versus collective responsibility for the earth and its resources. My venture applies the 4R's within higher education institutions to transform curricula in climate education to include culturally responsive discourse. This will allow us to recontextualize the way students are taught to address climate change and view environmental injustice.

9B. What is the responsibility of science education to inform and prepare students to know and understand death?

Sonya Martin, Seoul National University

Rachel Ruggirello, Washington University in St. Louis Institute for School Partnership

During the height of the pandemic when the world watched a daily tally of death counts increasing around the world, we began to discuss the impact that this increased media attention and awareness of death may have on students around the world. Through our conversations, we began to consider the myriad ways in which people experience and are exposed to death each day – through natural and manmade circumstances – including climate change, gun violence, drugs, and war. In this session we pose the question: what role and responsibility do science teachers, educators, and researchers have for educating students about death and dying?

(10) Centering Emotions and Creativity for Equity in Science Education

10A. What's grief got to do with it? Seeking stories and Black Joy in the outdoors

Charissa Jones, Oregon State University

What does your grief tell you? How have you learned to (not) attend to your grief? Is there a place for joy where grief has taken hold? How might we deepen our understanding of joy through and with grief? This Wondering seeks to tease out the connections between joy and grief in the context of the Black experience in the outdoors. Guided by Critical Race Theory, Critical Race Feminisms, and Black Feminist Thought this session encourages thinking with and through our understandings of both concepts in order to highlight the importance of grief in Black experiences of the outdoors in a way that does not reinforce deficit framings.

10B. The politics of teaching: Creative insubordination

Kara Haas, Michigan State University

Grace Tukurah, Michigan State University

This wondering is in response to ways in which some teachers in urban elementary schools are resisting policies that deny children the social and emotional benefits of being outside during the school day, via science instruction. This is an example of teachers engaging in creative insubordination. Some urban elementary schools have building-level policies that prevent students from engaging in outdoor recess, and in some cases, no recess at all. However, due to their convictions of the benefits of outdoor time for young children, teachers in our study are finding ways to grant access to the outdoors during the school day in opposition to stated policies that mandate otherwise.

10C. Centering science teachers' voices and experiences in a contentious time

Shannon Davidson, University of Alabama

As science educators, much of our work aims to create more just science landscapes by (re)imagining and (re)constructing science education, centering equitable pedagogies, critical consciousness, and frameworks that leverage asset-based orientations toward learners' cultural, linguistic, and experiential resources in science. Yet, in the current antagonistic political climate—where even problematic traditional views of science are in called into question—it is important to consider the ways in which far-right rhetoric are influencing teachers' practice and sense of well-being. By engaging in scholarship that centers the experiences, emotions, and epistemological commitments of science teachers who align their work with equitable pedagogies, we may glean important insights into what teachers know, do, and need to subvert unjust mandates that cause harm.

(11) Issues of Power in Learning and Assessment in Postsecondary Science Education

11A. The influence of power on organic chemistry learning

Ira Caspari-Gnann, Tufts University
Chinwendu Igboekulie, Tufts University

Undergraduate organic chemistry is known as a “weed-out” class and this “weeding out” disproportionately affects students marginalized by racism, sexism, and other systems of oppression. Inequities in attrition rates are the output of oppressive systems, but the mechanism of how power dynamics lead to these inequities are understudied. Thus, we Wonder how power dynamics influence students' organic chemistry learning. More specifically, we Wonder how we can approach this question analytically. We suggest a combination of critical discourse analysis and the analysis of learning on a discursive level in terms of continuity with student prior experiences and changes in ways of speaking. A critique of how power dynamics lead to inequities in learning can be a first steppingstone towards transformation.

11B. Exploring the tenets of critical pedagogy within an introductory undergraduate biology course at a Hispanic serving research institution

Corin Gray, University of Arizona
Lisa Rezende, University of Arizona
Susan Hester, University of Arizona

Angel Pimentel, University of Arizona
Ramin Yadegari, University of Arizona

Critical pedagogies have been described by a number of scholars as an effective and necessary way to serve all students. As introductory biology is a historically exclusive and gatekeeping space, the proposed presentation will ask participants to explore student activities implemented by several introductory molecular and cellular biology instructors in order to promote an affirming and validating environment. Our courses serve mixed and life science majors in class sizes of 200 - 500 students at the University of Arizona, a hispanic-serving research institution. Wonderings include: How can we incorporate critical pedagogy into our courses in a culturally affirming way? And, how do the proposed activities affirm students or help students unlearn the commonsense of engaging as science students?

11C. Supporting students who struggle with ungrading

Sara Dozier, CSU Long Beach

A small subset of students in my undergraduate science course report that my ungrading system makes them feel anxious and unsure of how they are progressing in the class. My current solution to this problem is to provide regular feedback to them about their assignments and to have them write a mid-semester reflection on their progress. I would love the support of the SEEDS community in finding a way to support my students that is manageable for me as well.

SEEDS MISSION

Science Education for Equity, Diversity, and Social Justice (SEEDS) is a non-profit organization committed to researching, building, and sustaining transformative educational opportunities in science with all students through critical engagement. SEEDS brings together researchers, teachers, parents, administrators, and community members who believe that transformative science education involves the active participation of all students in culturally and socially meaningful and contextually authentic science learning and SEEDS members also see the value of critical analyses of issues related to justice and power in science, science education, and science education research.

SEEDS VISION

Science, technology, engineering and mathematics play important roles in our global, diverse, and increasingly technologically-dependent society. Education in these areas is thus an area of critical significance for all members of our global community. Researchers and educators with a long commitment to addressing equity and social justice, many of whom are scholars of color, have moved beyond mainstream or superficial ways of addressing "STEM" education and instead seek to tackle these issues directly and with transformative action.

To this end, *Science Educators for Equity, Diversity, and Social Justice* (SEEDS) is an organization committed to researching, building, and sustaining transformative science education with all students through critical engagement. While primarily focusing on science education, SEEDS is committed to transdisciplinary scholarship and is interested in collaborations with educators and researchers from across the STEM/STEAM disciplines and beyond.

As such, SEEDS brings together researchers, teachers, parents, administrators, and community members who envision transformative science education as involving: (1) the active participation of all students in culturally and socially meaningful and contextually authentic science learning, and (2) critical analyses of issues related to justice and power in science, science education, and science education research.

SEEDS envisions science teaching and learning and science education research as endeavors that lead to increasing awareness of social and political contexts, the dismantling of traditional, colonizing understandings and practices of science and science education, and promoting collective responsibility for creating a just and equitable society.

SEEDS 2024 CONFERENCE THEME

Disturbing Settled Expectations: Re-imagining Science Education through Multiplicity

This year's conference theme aligns with SEEDS's objective to disrupt patriarchal, traditional, and elitist practices through inviting a plurality of approaches to research, pedagogy, and teacher education. We seek to bring to the fore a multiplicity of tactics to understand, confront, and undo power relations that have built and maintained hierarchies of knowledge, language, and personhood. Our 2024 conference aims to identify and disturb what has become settled in science/STEM education. How can we collectively unlearn the commonsense of science education and its colonial logics? How can we dismantle the hierarchies that our research, pedagogies, or community-based practices inadvertently maintain? In unsettling the field's expectations—and, crucially, recognizing many have never subscribed

to prevailing norms and objectives—what spaces open up for doing science/STEM education otherwise?

In re-affirming last conference’s call—*Refusing a Return to ‘Normal’*—SEEDS extends a commitment to name, interrogate and challenge settled expectations in science education and related STEM/STEAM fields. The phrase *settled expectations*, drawing on decolonial and critical race theorists, demands scrutinizing the taken-for-granted forms of knowledge and practices that continue to reinscribe social and environmental injustices (Bang et al., [2012](#); Warren et al., [2020](#)). These expectations have persistently elevated some ways of knowing, being, or languaging as scientific by diminishing others as obstacles, barriers, or mere stepping stones toward rarely questioned norms. Whether in informal learning environments, schooling, or STEM-related fields, these expectations have often made inclusion *conditional* on conforming to naturalized binaries and standards. Disturbing those expectations is to interrupt and interfere with an assimilationist and exclusionary status quo. It is also to re-imagine science education through multiplicity.

Multiplicity speaks to the strength we gather from tensions—an interweaving of difference that invites dissensus and refuses homogenized ideals. In attempting to disentangle our work from tightly woven premises of settler colonialism, white supremacy, and human supremacy, we embrace tensions arising in efforts to transform pedagogies, policies, and paradigms. The conference is an invitation to simultaneously hold open what constitutes justice and what requires transformation, while actively working to embody and enact commitments to transformative justice in a multiplicity of ways.

We envision our 2024 conference as a space to extend prior SEEDS conversations by sharing tools and tactics to unthink, unlearn, reimagine, and repurpose received curricular approaches, research paradigms, and institutional arrangements. Our program brings together a plurality of perspectives on how to resist, refuse, and reopen closed prescriptions of ‘normal,’ ‘standard,’ or ‘scientific’—a violent push for sameness in the name of preserving healthy nations or ensuring future success (e.g., Anglonormativity, cis-heteronormativity, ableist normativities). What would it take to eschew damage-centered accounts (Tuck, 2009) or to recognize and reclaim desires long dismissed and devalued across science/STEM education?

In keeping with SEEDS’ commitment to moving toward more equitable and just knowledge production and sharing practices, we highly value the expertise of K-12 teachers of science, whose contributions we recognize as often excluded or marginalized within the traditional knowledge hierarchy. Our commitments are to generative and affirmative partnerships and community collaborations in these critical conversations and transformative practices.

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SEEDS January 2024 Conference

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The SEEDS Program & Logistics Committees

SEEDS Organizing Body 2024

Original SEEDS

Co-founders: Alberto J. Rodriguez, Regina L. Suriel, Sara E. Tolbert, Randy Yerrick

First members in leadership roles: Philip Boda, Alexa Dimick, Sumi Hagiwara, Enrique Lopez, Daniel Morales-Doyle, Deb Morrison, Alexis Patterson, Cassie Quigley, Jean Rockford Aguilar-Valdez, Matthew Weinstein

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Committee members: Sanaz Farhangi, Rishi Krishnamoorthy, Sonya Martin, Joi Merritt, Sarah Radke, Sara Tolbert

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Organizational Structure Committee

Co-chairs: Alberto Rodriguez and Heidi Cian

Committee members: Roshni Bano, Sam Katende, Katie Stofer

Thank You to SEEDS 2024 Proposal Reviewers!

Alberto Rodriguez	Jie Zhang	Ryan Hassemer
Alicia Alonzo	Joi Merritt	Samuel Katende
Alison Mercier	Jrène Rahm	Sara Dozier
Allison Metcalf	Julie Libarkin	Sarah El Halwany
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